Running head: MEMORY CONFORMITY

I saw it for longer than you**:** The relationship between perceived encoding duration and memory conformity

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Abstract

The memory conformity effect is when people's memories become similar to one another's following a discussion. The present study examined whether an individual's beliefs in the quality of their memory, relative to another person's, mediates susceptibility to memory conformity. Perceived encoding duration was manipulated by telling dyad members that one person had encoded a set of pictures for either half or twice as long as their partner. In fact, actual encoding duration was the same for all participants. Dyad members each encoded slightly different versions of otherwise identical pictures and discussed them prior to an individual free-recall test. Participants who believed that they had encoded the pictures for half as long as their partner were more susceptible to memory conformity, as indicated by their increased tendency to report errant items at test that had been encountered from their partner rather than items that they had actually seen. This effect of perceived encoding duration on memory conformity was mediated through response order. A source-monitoring test found that these unseen items were errantly attributed to the pictures approximately 50% of the time. The findings are discussed in relation to the role of metamemory in susceptibility to memory conformity.

Keywords: Memory conformity; Post event information; Metamemory; Misinformation

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Introduction

Human memory is fallible and susceptible to influence. For example, within the eyewitness literature it is often found that exposure to post-event information (PEI) can affect a person's ability to report details of an originally encoded event (see Ayers & Reder, 1998; Ceci & Bruck, 1993; Loftus, Miller, & Burns, 1978; Payne, Toglia, & Anastasi, 1994). This phenomenon is commonly referred to as the *misinformation effect*. In everyday life PEI can be encountered when individuals who have shared the same experience discuss this with one another. Even when each person has witnessed the same event, their memories are likely to differ because of naturally occurring differences in the details attended to at the time, as well as actual or perceived differences in each person's ability to accurately recall those details. Recent research has shown that despite initial differences in recollections of an event, when two people talk about their memories they can influence one another such that their subsequent memory reports become similar (Gabbert, Memon, Allan, & Wright, 2004; Granhag, Memon, Gabbert, & Allwood, 2004; Mori, 2003; Paterson & Kemp, 2003; Wright, Mathews, & Skagerberg, 2005). This has been described as *memory conformity* (Gabbert, Memon, & Allan, 2003; Wright, Self, & Justice, 2000) and *social contagion of memory* (Meade & Roediger, 2002; Roediger, Meade, & Bergman, 2001).

In a typical memory conformity study two people are led to believe they have viewed an identical set of stimuli, when in reality they are shown stimuli that differ. They then discuss what they have seen prior to completing an independent memory report. For example, in Wright et al. (2000, Exp. 2), each member of a dyad saw one of two sets of 21 slides

depicting a criminal event. The critical difference between the sets was whether there was an accomplice. After the dyads discussed the event, aspects of one member's verbal report was often found to influence what their partner later reported when tested individually. The typical finding was conformity to the most confident dyad member (Wright et al., 2000). More recently, Gabbert et al. (2003) showed dyad members the same event but filmed from different angles to simulate different witness perspectives. Critically, some features of the event were visible to one member of the dyad but not to the other. These contrasting details often arose in the discussions and people's memories were transformed by what the other person had said. Seventy-one percent of participants reported errant details acquired during the discussion. Furthermore, 60% of participants reported that a theft had occurred even though a crime was not visible in the version of the event that they had seen.

The memory conformity paradigm described above enables researchers to investigate the effects of discussion on subsequent recall accuracy in ecologically valid settings. Memory conformity following a discussion is a well-established finding in this paradigm. The aim of the current study is to improve our understanding of how memory conformity might occur. Our recent research has investigated this issue by analysing the dialogue between dyad members when they discussed encoded stimuli to reveal where and when any influence occurs. (Gabbert, Memon & Wright, in press). Our most striking finding was a large association: the witness *initiating* the discussion was most likely to influence the other witness's memory report. Thus the witness hearing the misinformation conformed to their co-witness. This was particularly evident when witnesses chose not to challenge their co-witness, but was also observed when a dispute had arisen over what had been witnessed. Furthermore, the witness initiating the discussion was also the most *resistant* to influence even when their memory was disputed by their co-witness.

This novel and intriguing finding is explored further in the present research. We believe it is likely that the association between response order and conformity is spurious, with each being influenced by other variables. Following Wright et al's (2000) findings, an obvious candidate is confidence in one's memory. For example, if one group member feels that the quality of their memory is superior to that of another person's, then it is feasible that they are the first to report their memories in a discussion, and the least likely to be influenced when hearing other people's memory reports. Thus, the current research examines the role of confidence in one's memory as a potential mediating factor underlying the memory conformity effect. We manipulate perceived memory quality to examine whether an individual's belief in the strength of his or her memory for encoded stimuli, relative to another person's, affects response order within a joint recall discussion and susceptibility to memory conformity in a subsequent individual recall test. Actual memory ability is not the primary focus because past research has shown that susceptibility to memory conformity does not always bear a simple relationship to memory for the encoded stimuli. For example, Gabbert et al. (2003) found that participants with poor memory for an event were no more susceptible to memory conformity than were those with good event memory (see also Gabbert et al. 2004; Mori, 2003). It is hypothesised that an individual's *beliefs* about their memory ability may affect the extent to which individuals rely on their own recollections in a recall test.

Theoretical support for the hypothesis that there may be an association between belief in one's memory and susceptibility to memory conformity comes from literature on metamemory. Metamemory refers to people's knowledge and beliefs about their memory, and how these are used to regulate what is reported (Koriat, Goldsmith, & Pansky, 2000; 2003). For example, research has shown that some metacognitive judgements involve a conscious deliberation of available information to form an educated guess about one's knowledge (see Jacoby & Brooks, 1984; Koriat & Levy-Sadot, 1999; 2000). In relation to the current

research, if a person lacks confidence in their own memory as a result of our experimental manipulation, they might be less likely to report their recollections in a joint recall discussion. In addition, they might be more likely to place trust in the validity of their partner's recollections when reporting information in the individual recall test. Supporting this, research has found that perceptions of source credibility can mediate susceptibility to influence, such that a larger misinformation effect is often found when the source of the PEI is perceived as highly competent (e.g., Echterhoff, Hirst, & Hussy, 2005; Hoffman, Granhag, Kwong See, & Loftus, 2001; Kwong See, Hoffman, & Wood, 2001; Smith & Ellsworth, 1987).

In addition to examining how metacognitive judgements, based on one's beliefs about the quality of their memory for encoded stimuli, can influence response order and memory conformity, the current paper also examines the extent to which participants can accurately determine the source of information reported at test. Post-event details might be errantly reported at test because of a source confusion, which can occur when a memory from one source (e.g., a discussion with another person) is misattributed to a different source (e.g., the witnessed event) (see Johnson, Hashtroudi, & Lindsay, 1993). Alternatively, post-event details might be reported if they are believed to be valid, regardless of whether they can actually be remembered as part of the originally encoded stimuli or not. The decision to report these details might be based on a metacognitive judgement regarding beliefs about which person's memory is most likely to be accurate.

In sum, in a study using the memory conformity paradigm, dyad members will receive false feedback that one has encoded a set of stimuli for twice the time (vs. half the time) to that of their partner. A relationship between perceived memory quality and susceptibility to memory conformity is hypothesised, where participants who believe they have encoded stimuli for less time will be more susceptible to memory conformity. We will examine to

what extent this is mediated by response order in the joint recall discussions. Based on prior research evidence (Gabbert et al., 2003), no relationship between actual memory performance and susceptibility to memory conformity is expected. Furthermore, no differences in memory accuracy for neutral items is expected (i.e., where no PEI is encountered), as despite the feedback received the participants will have actually viewed the stimuli for the same length of time and thus should be able to report a similar number of neutral details at test.

Method

Participants. Ninety-two first year psychology students were tested in return for course-credit. Two pairs were excluded from analysis because their discussions were too quiet to be transcribed. Thus, data from 88 participants were included (18-28 years; M = 19.73; SD = 2.37).

Materials

Pictures. Four pictures of complex scenes containing a number of details regarding objects, descriptions, etc, were used as stimuli to encode (adapted from Forbes & Venneri, 2002). Two versions of each picture (A and B) were created that were the same except for two *contradicting* details, which we refer to as *critical items* (for an example see Appendix A, for full details of all critical items see Table 1). Each member of a dyad saw a different version of each of the four pictures. Thus, over four pictures dyad members encountered eight critical items that contradicted a detail their partner had seen. Pilot data (n = 19) showed that the contradicting details of the different versions were remembered approximately as well as each other. The versions of pictures seen were counterbalanced across experimental conditions.

Table 1 about here

Procedure

Participants were tested in previously unacquainted dyads. On arrival dyad members were seated at computer desks with their backs to one another. The following instructions were given:

> *"You have volunteered to take part in a picture memory study. Over the course of this experiment, you and a partner will be given four pictures to study, which you will be asked to recall both jointly and individually. Each time you are shown a picture one of you will be able to study it for either twice or half as long as your partner. The computer will randomly assign the amount of time you see a picture for. There will be memory tests for the studied pictures."*

Although each participant was told that they had seen the pictures for twice (or half) as long as their partner, they actually saw the pictures for the same amount of time (30 seconds each). Participants remained in the same condition throughout, i.e., either always believing that they had seen the pictures for twice or half the time as their partner.

To start, participants worked through a short paper and pencil filler task at their own pace. The filler task was in place to defend against dyad members viewing the pictures at exactly the same moment, which might have raised the potential for them to guess the experimental manipulation. On completion they were directed to the computer for the next phase of the experiment. Instructions on the computer screen informed participants that a picture would appear for them to study once they pressed a key indicating that they are ready to begin. The picture remained on the screen for 30 seconds. This was followed by a message that either said *"You have seen this for <u>twice</u> as long as your partner"* or *"You have seen this*

for <u>half</u> as long as your partner". Participants were asked to keep a record of this information for the experimenter to make sure that they had paid attention to the manipulation. Before continuing with the next stage of the experiment, participants completed a visual puzzle where they had to find a path from A to B through a maze.

Next, dyad members were asked to jointly recall the picture they had just studied. This discussion was audio-taped. Participants were given no further instructions than simply to discuss the picture in as much detail as possible until no further details could be recalled. No time limit was imposed. Following this collaborative recall discussion, participants then individually completed a free recall test. Instructions guided them to think back to the picture they had just viewed, rather than just to the discussion about the picture, and to report the details that they could remember seeing. No time limits were imposed for the joint or individual recall tasks. On completion, participants worked through another paper and pencil filler task individually for approximately five minutes. Picture 2 was then studied for 30 seconds in the same way as before, with each dyad member seeing either version A or B, and believing that they had viewed the picture for either twice or half as long as their partner. Another maze filler task was then completed before the co-witness discussion phase for Picture 2. The same procedure was followed for the individual free recall. This procedure was repeated until all four pictures had been shown.

At the end of the experiment, a source-monitoring task was administered. Participants were asked to review their four free recall responses and to *circle* the details that they remembered hearing from their co-witness, but not actually seeing themselves. Participants were asked to *leave unmarked* the details that they did remember seeing in the pictures. They were also asked to *underline* the details for which they could not remember the source.

A post-test manipulation check asked dyad members if they had been aware that they had seen different pictures. None of the participants expressed suspicion about the experimental manipulation.

Coding

The four discussions for each dyad were audio-taped, transcribed, and coded in relation to which member of the dyad had been the first to mention a critical item. Coders were blind as to which experimental condition participants had been assigned to. The free recall responses were coded in relation to the number of accurate and errant neutral details from the pictures, and the number of accurate and errant critical items. A critical item was deemed accurate if the participant had reported a critical item that they had seen. In contrast, a critical item was coded as errant if the participant had reported a critical item that their partner had seen. Data from the four discussions and four individual free recall tests were pooled for the analyses.

Results

The primary aim of the current research was to explore the effects of perceived encoding duration on participants' performance in the co-witness discussions as well as their susceptibility to memory conformity in the individual recall tests. In addition we explored the accuracy of source judgements regarding accurate and errant critical items reported at test by participants in the two experimental conditions.

Preliminary analyses: Memory accuracy for neutral items

The individual free recall responses were coded in relation to the number of correct and incorrect items of neutral information recalled about the pictures. This analysis did not include any of the 'critical' co-witness items. There was no difference in memory accuracy between participants who had viewed either Versions 'A' or 'B' of the pictures, for either the number of correct, or incorrect, items of information reported (highest $F(1, 86) = 2.40$, ns). Furthermore, as hypothesised, no difference in the number of correct, or incorrect, neutral items of information reported was found between conditions (F's $(1, 86) < 1$). See Table 2 for means.

Table 2 about here

Further analysis investigated whether there was any relationship between the number of accurate items of information reported at test and the number of errant co-witness details reported at test. There was a non-significant correlation ($r = .04$), suggesting that susceptibility to co-witness influence was not related to memory for the pictures (as measured by the number of accurate event details recalled). Participants who had not been influenced by their co-witness reported an average of 66.07 (SD = 19.55) accurate items of information at test, and participants who were influenced (i.e., reported at least one unseen detail at test) recalled an average of 61.53 (SD = 18.10) accurate items of information at test ($F(1, 86) = 1.14$, ns).

Analysis of co-witness discussions

The number of contradicting *critical items* discussed varied from 1 to 7 (mean = 4.08), with 359 critical items discussed in total, across the four pictures. Participants who believed they had seen the pictures for twice as long as their partner mentioned significantly more critical items in the co-witness discussions (means = 4.52 and 3.64 for 'twice the time' and 'half the time' respectively, $F(1, 86) = 9.46$, $p < .01$; $MSE = 17.28$; $\eta^2 = .10$). They were also more likely to mention the critical items first in the discussions, before their partner had mentioned the corresponding critical item that they had seen (means = 3.75 and 2.43 for 'twice the time' and 'half the time' respectively ($F(1, 86) = 20.67$, $p < .01$; $MSE = 38.23$; $\eta^2 = .19$).

Analysis of individual free-recall

Of the 359 critical items mentioned in the co-witness discussions, 28% (102 out of 359) were later errantly reported in the final free recall test, despite an instruction to report only what was seen. Thus, a memory conformity effect was observed. The following analyses focus only on the critical items that were discussed. A mixed design ANOVA revealed an interaction between condition and accuracy ($F(1, 86) = 7.61$, $p < .01$; $MSE = 12.02$; $\eta^2 = .08$), where more errant critical items were reported on average by participants who believed they had seen the pictures for half as long as their partner, and more correct critical items were reported by participants who believed they had seen the pictures for twice as long as their partner (see Figure 1).

Figure 1 about here

To investigate whether the likelihood of being influenced could be predicted, a logistic regression analysis was performed with 'influenced' (yes/no) as the outcome variable and two predictors: 'perceived encoding duration' (half the time/twice the time) and 'mentioned critical item first?' (yes/no). Results indicated that participants were more likely to be influenced if they were not the person who initially mentioned the critical item (χ^2 (1) = 105.98, $p < .01$). The odds ratio showed that influence was 12 times more likely to occur in cases where the individual had not been the first to mention the critical item that they had seen (lower and upper confidence intervals = 7.23 and 21.38 respectively). Perceived encoding duration had a non-significant effect in relation to predicting influence (χ^2 (1) = 1.74, ns). Furthermore, the interaction between mentioning a critical item first and perceived encoding duration had a non-significant effect on the model (χ^2 (1) = 2.51, ns). Thus, after controlling for who mentions a critical item first, the experimental manipulation did not produce a significant effect. This suggests that the effect of perceived encoding duration on memory conformity is mediated through response order.

Source judgements

Participants were asked to identify the source of the information they had provided in their free recall reports about the pictures they had seen. Table 3 presents a summary of the source judgements given for the incorrect (co-witness) critical items reported. There was no association between experimental condition (half the time vs. twice the time) and the accuracy of source judgements ('Saw it in picture' vs. 'Co-witness told me') for participants who had errantly reported a critical item (χ^2 (1) < 1).

Table 3 about here

Discussion

The current study manipulated *perceived* encoding duration within dyads to examine the effect that this has on susceptibility to memory conformity. *Actual* encoding duration was held constant across all participants. Our main finding was that participants who believed they had encoded the pictures for 'half the time' as their partner were more susceptible to memory conformity, reporting significantly more errant critical items at test, and were significantly less accurate in reporting the critical items that they had seen themselves. As hypothesised, *actual* memory quality for the encoded stimuli was *not* associated with susceptibility to memory conformity. There was no difference in the accuracy of the source judgements regarding errant critical items reported at test for participants in the two experimental conditions. Also in line with predictions, the mean number of accurate neutral items recalled about the stimuli was approximately the same for participants who believed they had seen the pictures for more versus less time than had their partner. This suggests that actual memory ability was equivalent across conditions. Furthermore, it draws attention to the fact that the effects of the experimental manipulation were manifest only when the discrepant critical items were encountered in the co-witness discussions, and did not have an effect on the reporting of neutral items.

Our findings have important applied implications. For example, they suggest that eyewitnesses who believe that they have an inferior memory quality to others are more likely to become influenced by, and subsequently report, items of errant PEI encountered from another person. Furthermore, our source monitoring data suggest that errant details reported at test are often attributed to the wrong source, such that they are believed to have been seen as opposed to originating from the post-event co-witness discussion. Thus, the police may view consistent statements from witnesses as valuable corroborative evidence, when in fact our

research highlights the possibility that such evidence is potentially contaminated as a result of memory conformity (see Granhag, Ask, & Rebelius, 2005)**.**

Why does perceived encoding quality influence susceptibility to memory conformity? The data show that the perceived encoding manipulation affected the number of critical items mentioned in the joint recall discussions. Participants who believed that they had encoded pictures for twice as long as their partner recalled significantly more critical items, and were more likely to report them first, i.e., before their partner mentioned the critical item that they had seen. The data suggest that the effect of mentioning a critical item first is accounting for the difference in memory conformity found between participants in each experimental condition. Experimental condition alone did not predict susceptibility to influence. Participants who believed that they had encoded the stimuli for half as long as their partner were more susceptible to memory conformity because they had encountered more misleading critical items from their partner in the discussions. This finding is interesting because it implies that the feedback manipulation influenced the social dynamics within the joint recall discussions. Dyad members who saw themselves as relatively more knowledgeable about the stimuli or as having a better memory quality appeared to dominate the discussions by reporting more critical items than their partner, and often before their partner had reported their own recollections. Thus meta-memorial beliefs determined how much misleading information one witness communicated to another witness by influencing response order in the discussions.

Our previous research has also found a relationship between the order in which critical items are reported in a joint recall discussion and subsequent memory conformity (Gabbert et al., in press). Specifically, individuals who encounter information before reporting their own recollections are more susceptible to memory conformity. Reysen (2005) draws upon the 'social loafing' hypothesis (Latané, Williams, & Harkins, 1979, see also, Chapman, Arenson,

Carrigan, & Gryckiewicz, 1993) from the social influence literature to offer a plausible explanation for this. Research on social loafing has found that when one individual is actively contributing to a group activity (such as joint recall) then other members of the group will often exert less cognitive effort themselves. Thus, it is possible that participants do not work as hard to recollect the stimuli themselves when listening to their partner recall his/her own memories, and subsequently conform to what their partner has said, regardless of whether or not it is accurate.

Alternatively, hearing another person report their memories before recollecting one's own might have a deleterious effect on an individual's subsequent ability to report their memories optimally. Such an effect has previously been demonstrated in tests of joint retrieval of word lists (see, Basden, Basden, Bryner, & Thomas, 1997; Meudell, Hitch, & Boyle, 1995; Weldon & Bellinger, 1997; Wright & Klumpp, 2004). For example, many researchers have found that collaborative retrieval can inhibit recall performance. This is currently thought to be caused by a disruption to normal memory processes, where encountering another person's recall output prior to recalling an item oneself can interfere with one's naturally ordered retrieval strategy, which can cause some items to be forgotten (see Basden et al. 1997; Wright & Klumpp, 2004). In relation to the current study, it is possible that this might lead to a larger reliance on their partner's recollections. Such an effect has so far only been demonstrated with relatively artificial stimuli, however, this does not rule out the fact that collaborative inhibition is also possible in a joint recall discussion.

It was suggested in the introduction that a conscious metacognitive judgement might be responsible for increased memory conformity among participants who believed their encoding quality for the stimuli was inferior to that of their partner. However, the source monitoring data do not support this, as there were no differences in source monitoring accuracy between the two conditions. Across the conditions, the source monitoring data

showed that critical items that had been encountered as PEI in the discussions, rather than actually seen, were only attributed to the correct source approximately 50% of the time. Thus, it appears that encountering PEI in a discussion can result in source misattribution error. Errors are focused upon here (rather than accurate source attributions) because of the obvious applied implications in a forensic setting. Based upon Zaragoza and Lane's (1994) research, there is reason to believe that encountering PEI in a joint-recall discussion might be particularly conducive to encouraging subsequent source-confusions. Zaragoza and Lane (1994) found that participants were significantly *more* likely to make source monitoring errors when they were required to actively retrieve (i.e., 'reactivate') the originally encoded information while processing the misleading PEI, than when the originally encoded information was not reactivated. This finding is particularly pertinent to the present research. Discussing the details of an event with a co-witness is a powerful form of encountering PEI because it occurs when the originally encoded memory is actively being retrieved.

In sum, participants who believed that they had encoded pictures for half as long as their partner were more susceptible to memory conformity despite there being no differences in the pattern of source-monitoring accuracy across the two experimental conditions. This effect of perceived encoding duration on memory conformity was mediated through response order. Thus, the memory conformity effect has once again been found, this time with a little more understanding of the underlying mechanisms.

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Table 1. *Outline of the critical differences between the two versions of each picture*

Picture	Version A	Version B
1, Kitchen	a) 2 cups and a plate near the sink b) Tree visible through kitchen window	a) 2 cups and a teapot near the sink b) House visible through kitchen window
2, Town Centre	a) Man up ladder painting window frame b) Man walking his dog	a) Man up ladder washing window b) Woman walking her dog
3, Living Room	a) Rug visible in bottom left of picture b) Woman holding a cigarette	a) Coffee table visible in bottom left of picture b) Woman holding a glass of red wine
4, Crossroad	a) Grocers shop on street corner b) Yellow car with baby in the back	a) Florists on street corner b) Green car with baby in the back

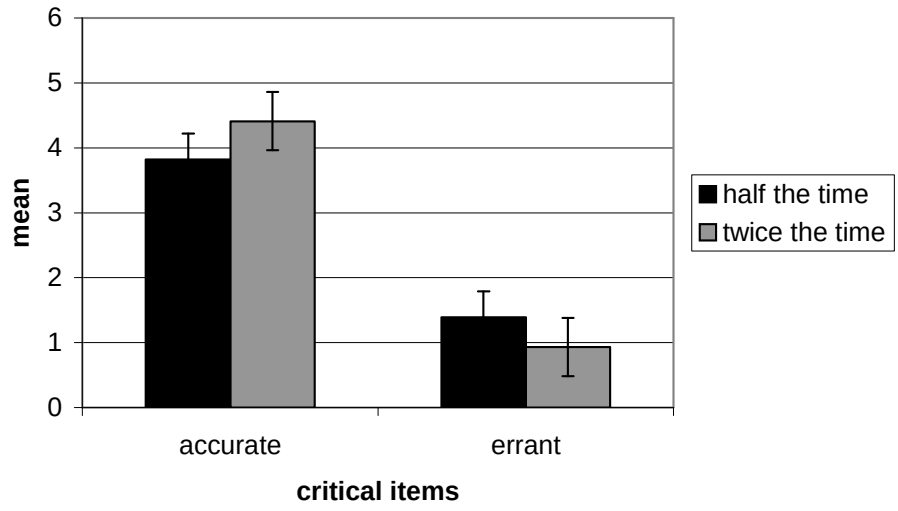
Table 2. *Number of accurate and errant neutral items recalled from the pictures (SD in parentheses)*

	Perceived encoding duration	
	Half the time	Twice the time
Accurate neutral items	60.86 (19.55)	65.09 (17.53)
Errant neutral items	4.55 (4.62)	4.25 (2.87)

Table 3: *Proportion of source judgements given to the incorrect (co-witness) critical items reported at test (Raw data in parentheses)*

		Source judgement		
		Errant: 'Saw it in picture	Accurate: 'Co-witness told me'	'Can't remember'
Half the time	Influenced *(Errant critical item reported)*	.56 (35)	.39 (24)	.05 (3)
Twice the time	Influenced *(Errant critical item reported)*	.48 (19)	.48 (19)	.04 (2)

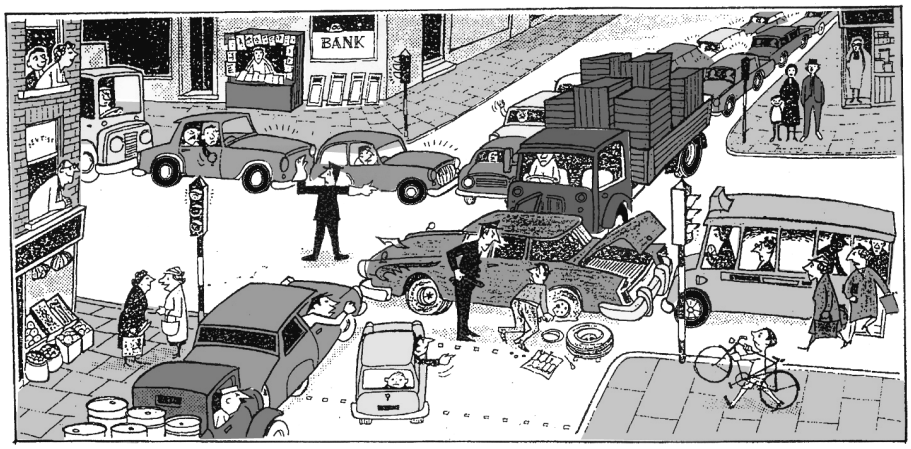
Figure 1. *Mean number of accurate and errant critical items reported in each condition*



Appendix A.

Example of stimuli (original format is full colour). The two critical items in these pictures are the type of shop seen in the corner on the picture (grocers shop or florist shop), and the colour of the car seen at the bottom of the picture. Full colour stimuli can be viewed and downloaded at http://portal.abertay.ac.uk/pls/portal/URL/PAGE/shared/f/f513576.

Crossroad Scene: Version A



Crossroad Scene: Version B